VELEUČILIŠTE U KARLOVCU
Karlovac University of Applied Sciences

SYLLABUS PREDMETA

General information

Course title:	Mechanics II
ISVU[1] course code:	38917
Studies in which the course is taught:	Professional Baccalaureus Engineer in Mechatronics Engineering
Course Instructor:	Doc.Ph.D. Tihomir Mihalić, dipl.ing., collage prof.
Course Assistant:	N/A
ECTS credits:	5.0
Semester of the course execution:	III[rd] semestar
Academic year:	2022/2023
Exam prerequisites:	N/A
Lectures are given in a foreign language:	english
Aims:	The fundamental / main goal is to (1) acquire theoretical knowledge of classical mechanics of motions, namely kinematics and dynamics. This includes knowledge about point and rigid body kinematics and the knowledge about dynamics of point assembly and rigid body systems and (2) acquisition of basic competences for numerical solution of motion mechanics tasks. Additional / supportive goals are aimed at (3) developing cognitive and presentation skills with (4) being able to understand each kinematics' and dynamic's problem in engineering structures, machines and systems.

Course

Course structure	Number of contact hours per week:	Number of contact hours per semester:	Student's requirements by type of teaching:
Lectures:	2	30	attendence 80%
Tutorials:	2	30	attendance 80%
Practical (lab) sessions:	-	-	
Seminars:	-	-	
Field work:	-	-	
Other:	-	-	
TOTAL:	4	60	

Monitoring of students' work, knowledge evaluation and learning outcomes

	I1: Explain the concepts of velocity and acceleration for straight and curved motion	exam	Oral exam 60 points Written exam 40
	I2: Distinguish the difference between: relative and given velocity, translational and rotational motion (in Descartes and natural coordinates systems) and angular velocity and acceleration	exam	
	I3: Present velocity diagram, instantaneous center (pole of velocity), acceleration diagram, D'Alembert principle and additional or Coriolis acceleration	exam	
	I4: Classify the quantity of motion, momentum, work, potential and kinetic energy	exam	
	I5: Assess the factors that influence the momentum of inertia	exam	

[1] ISVU – Information System of Higher Education Institutions in Croatia

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	I6: Illustrate the dynamics of rotational motion and the dynamics of a body planar motion	exam	
Alternative formation of the grade (I1 – I6)	**or** alternative formation of the grade: I1 - I6 Paper 40 points Final oral exam 60 points		TOTAL: 100 points
Students' competencies	Students will acquire general and professional competences in mechanics of motion, ie kinematics and dynamics. Knowledge of point and solid body kinematics and dynamics of particle and rigid body systems are included in that knowledge. The student will be able to identify critical points in mechanical structures, machines and systems. Students will be able to apply the acquired knowledge independently of the business subject's niche; so not only in production companies but also in the design, maintenance and overhaul of dynamic systems.		

Prerequisites for course approval (lecturer's signature):	Attendance at lectures and exercises minimum 80%
Prerequisites for taking exams:	Professor's signature that proofs that student has completed required obligations
Grading scale:	(According to the Regulations on student assessment of Karlovac University of Applied Sciences, Article 9, Paragraph 5) 90-100 - excellent (5) (A) 80 to 89.9 - very good (4) (B) 65 to 79.9 - good (3) (C) 60 to 64.9 - sufficient (2) (D) 50 to 59.9 - sufficient (2) (E) 0 to 49.9 – fail (1) (F)

ECTS structure

ECTS credits allocated to the course reflect the total burden to the student during adoption of the course content. Total contact hours, relative gravity of the content, effort required for exam preparation, as well as, every other possible burden are taken in account:

Attendance (active participation)	**Term paper**	**Composition**	**Presentation**	**Continuous assessment and evaluation**	**Practical work**
0,5					
Independent work	**Project**	**Written exam**	**Oral exam**	**Other**	
		1,5	3		

Review of topics/units per week associated with learning outcomes

Week	Lectures topics/units and learning outcomes:	Tutorials topics/units and learning outcomes:
1.	Introduction; Point kinematics; Movement on a straight direction; Velocity, acceleration; Uniform and variable motion. **I1**	Numerical problems: Point kinematics; Movement on a straight direction; Velocity, acceleration; Uniform and variable motion. **I1**
2.	Curvilinear movement; Trajectory, velocity, acceleration; Vector and analytical representation in Descartes coordinate. **I1**	Numerical problems: Curvilinear movement; Path, velocity, acceleration; Vector and analytical representation in Descartes coordinate. **I1**
3.	The laws of motion in the natural coordinate system; translation; Rotation around fixed axis; Angular velocity and	Numerical problems: The laws of motion in the natural coordinate system; translation; Rotation around fixed axis; Angular velocity and acceleration.

	acceleration. **I2**	**I2**
4.	Uniform and variable rotation; Planar motion; Determination of velocity and acceleration; Current pole of a planar displacement and accelerations. **I2**	Numerical problems: Uniform and variable rotation; Planar motion; Determination of velocity and acceleration; Current pole of a planar displacement and accelerations. **I2**
5.	Velocity and Acceleration Plan; Trajectories, Kinematic analysis of simple mechanisms. **I3**	Numerical problems: Velocity and Acceleration Plan; Trajectories, Kinematic analysis of simple mechanisms. **I3**
6.	Relative movement; Relative, absolute and transmitted trajectories; Velocity and acceleration; Coriolis's acceleration. **I2 I3**	Numerical problems: Relative movement; Relative, absolute and transmitted trajectories; Velocity and acceleration; Coriolis's acceleration. **I2 I3**
7.	Introduction to Dynamics; Newton's Laws; D'Alambert's principle of inertial force; Dynamic balance of forces. **I4**	Numerical problems: Introduction to Dynamics; Newton's Laws; D'Alambert's principle of inertial force; Dynamic balance of forces. **I4**
8.	Quantity of motion, momentum, force work, kinetic energy of a material point. **I4**	Numerical problems: Quantity of motion, momentum, force work, kinetic energy of a material point. **I4**
9.	Potential energy; Gravity and spring potential energy; Maintenance of energy; Dissipative forces. **I4**	Numerical problems: Potential energy; Gravity and spring potential energy; Maintenance of energy; Dissipative forces. **I4**
10.	Dynamics of relative motion of a point; Coriolis inertial force. **I4**	Numerical problems: Dynamics of relative motion of a point; Coriolis inertial force. **I4**
11.	Moment of inertia; Axial, polar, centrifugal and main moment of inertia; Steiner's rule. **I5**	Numerical problems: Moment of inertia; Axial, polar, centrifugal and main moment of inertia; Steiner's rule. **I5**
12.	Body rotation; Newton's law of rotation; Rotational quantity of motion, momentum, work, power and energy. **I6**	Numerical problems: Body rotation; Newton's law of rotation; Rotational quantity of motion, momentum, work, power and energy. **I6**
13.	Planar motion dynamics; Center of gravity movement and rotation around center of gravity; Planar motion kinetic energy	Numerical problems: Planar motion dynamics; Center of gravity movement and rotation around center of gravity; Planar motion kinetic energy
14.	Dynamic reactions in rotation of the body about a fixed axis; Dynamic balancing principles. **I6**	Numerical problems: Dynamic reactions in rotation of the body about a fixed axis; Dynamic balancing principles. **I6**
15.	The dynamics of the system of material bodies; Internal forces; Balance of separate bodies. **I5 I6**	Numerical problems: The dynamics of the system of material bodies; Internal forces; Balance of separate bodies. **I5 I6**

References

REFERENCES (compulsory/additional):

Required references

Autor	Naslov	Izdavač	Izdanje	God.
S. Jecić	Mehanika (kinematika i dinamika)	Tehnička knjiga, Zagreb	1.	1989.

Additional references

Autor	Naslov	Izdavač	Izdanje	God.
Z. Sapunar	Kinematika	Sveučilište u Rijeci	2.	1989.
Z. Sapunar	Dinamika	Sveučilište u Rijeci	2.	1989.

Exams for the academic year: 2022/2023

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Exam dates:	According to the schedule of exams for academic year 2022/2023

Contact information

1. Course Instructor/Lecturer:	Doc.dr.sc. Tihomir Mihalić, v.pred.
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Office hours / Consultations:	
2. Course Instructor/Lecturer:	
e-mail:	
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